



NUCLEAR ENGINEERING
TEXAS A&M UNIVERSITY

Texas A&M University THERMAL-HYDRAULIC LABORATORY

Overview and Capabilities

NSUF/GAIN Nuclear Thermal-Hydraulics Workshop
Idaho Falls, ID – July 13th, 2017



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Overview

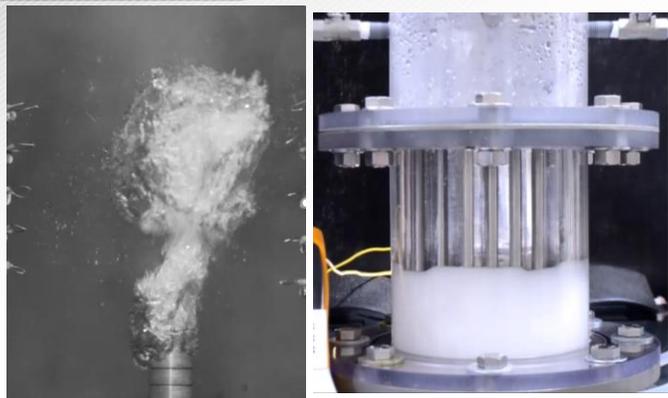
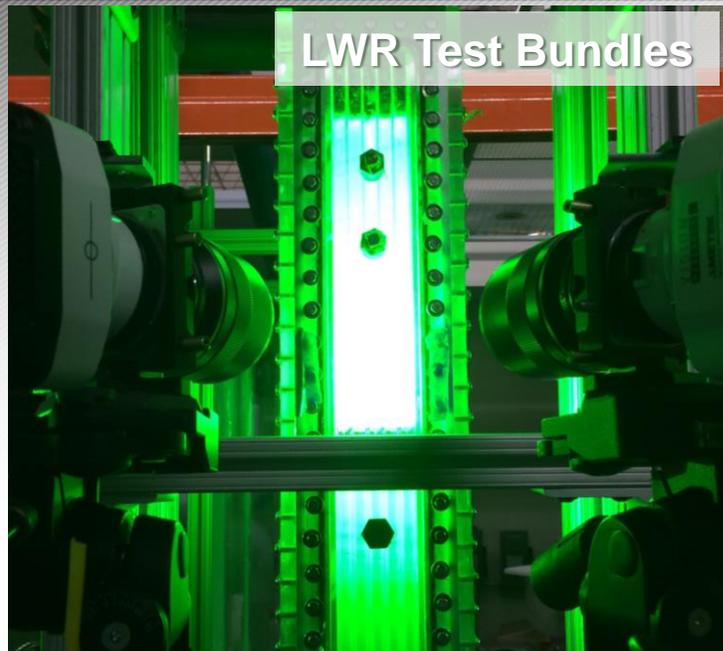
Supported Research on:

- Light Water Reactors
- Advanced Reactors
- High Temperature Gas Cooled Reactors



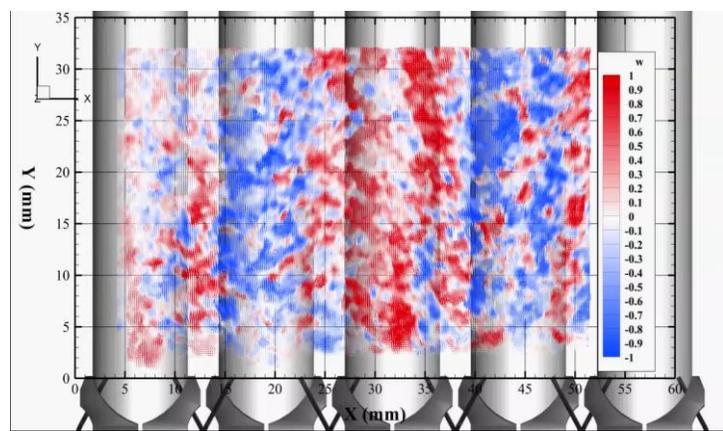
Light Water Reactors Technology

LWR Test Bundles

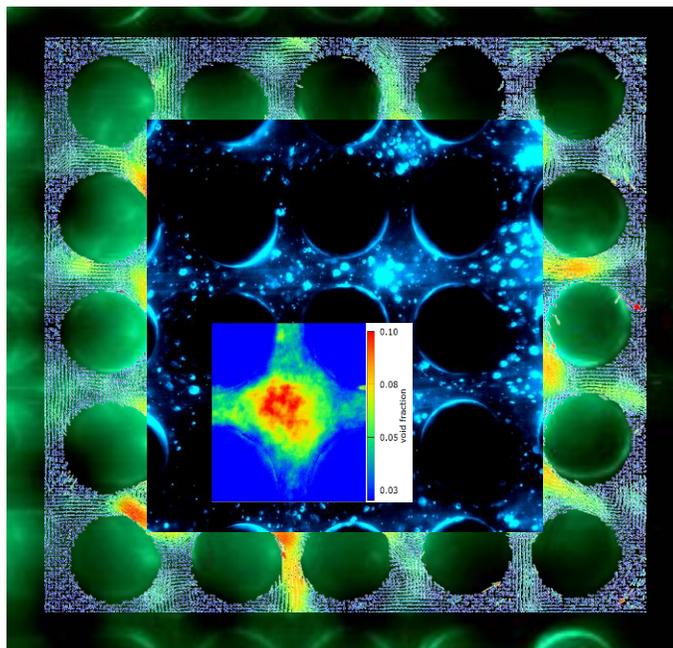


Multi-Phase Flow

CHF Test Facility



Single-Phase Flow





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Critical Heat Flux (CHF) Test Facility

BASIC FEATURES

Parameter	Value
Total Power	0.5 MW
Power Supply	DC
Max. Operating Pressure	500 psia
Max Temperature	400 °F
Max Operating Flow Rate	124,600 lbm/hr

- Customizable bundle configuration (rods, spacers...)
- Supports different operating conditions
- Dedicated AC and DC power supply
- Cooling water source from dedicated Cooling Tower



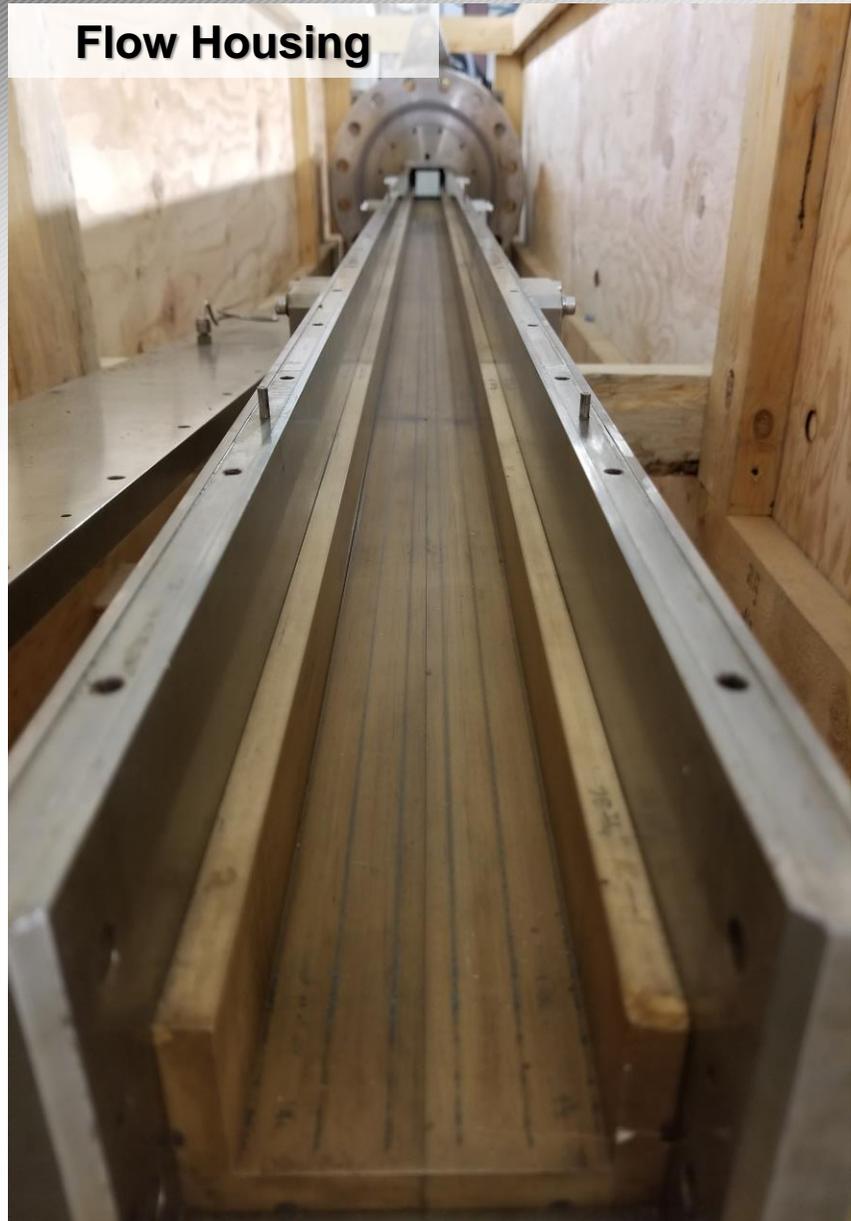


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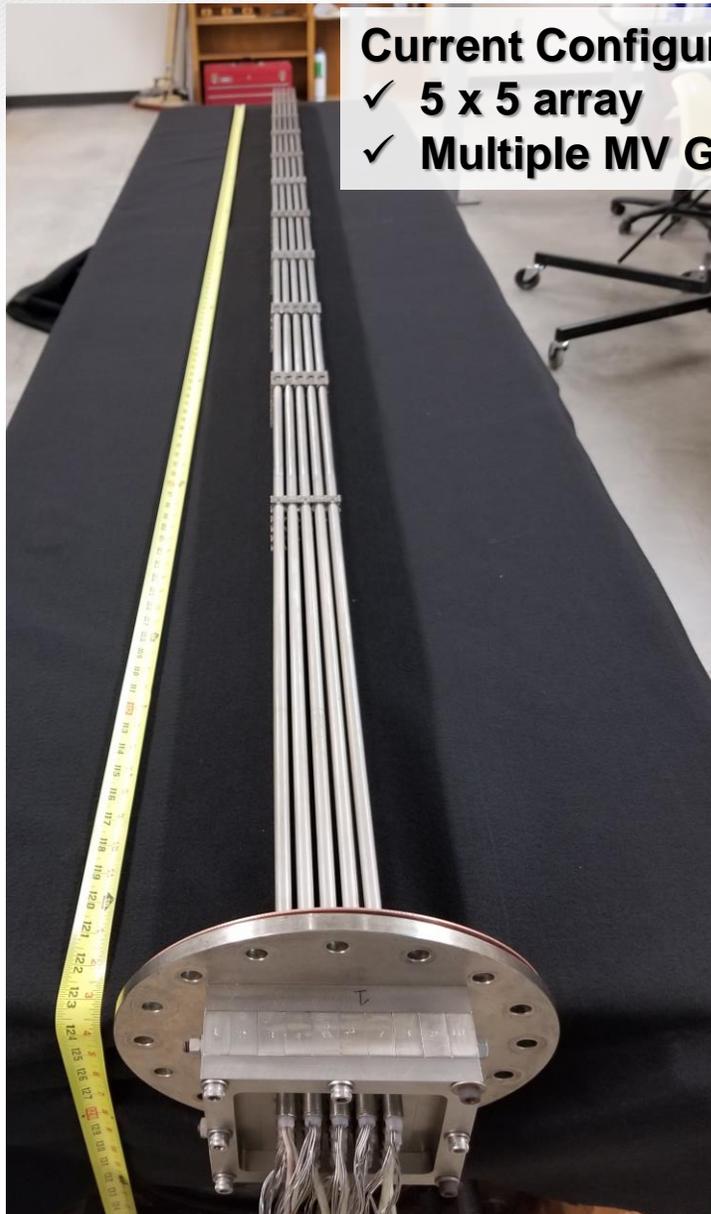
Critical Heat Flux (CHF) Test Facility

Flow Housing

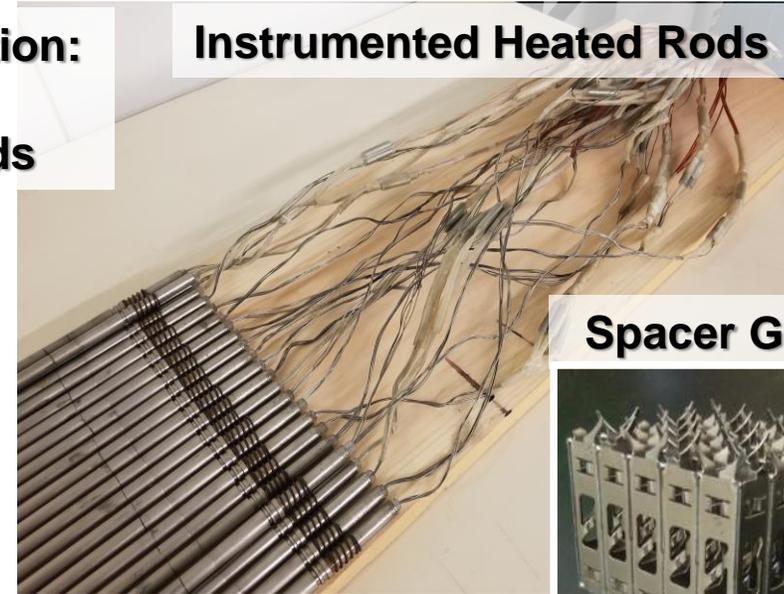


Current Configuration:

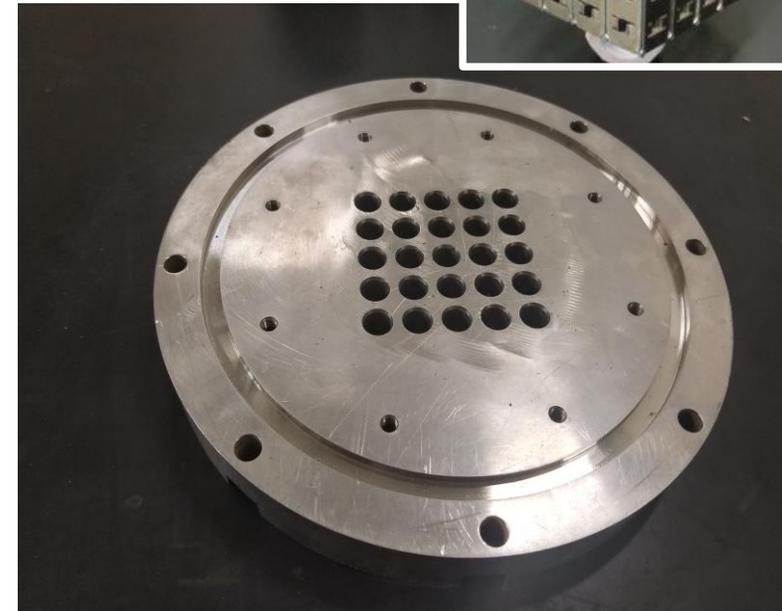
- ✓ 5 x 5 array
- ✓ Multiple MV Grids



Instrumented Heated Rods



Spacer Grids

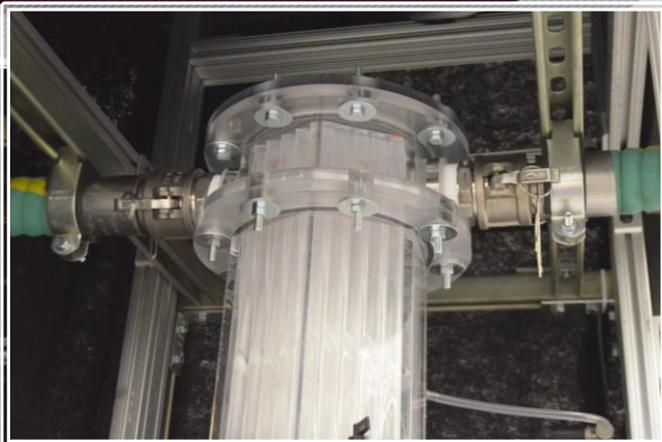


Advanced Nuclear Reactors Technology

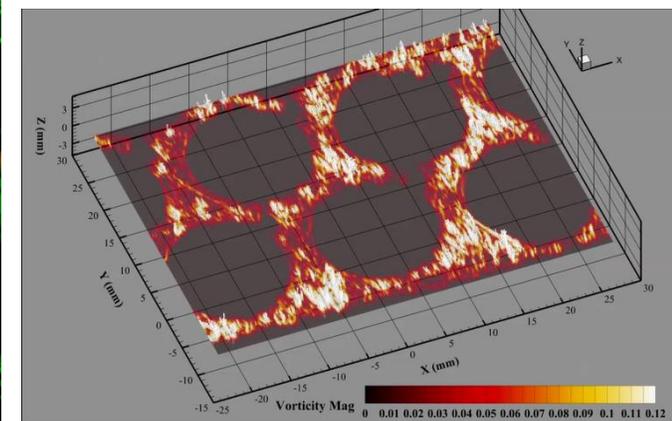
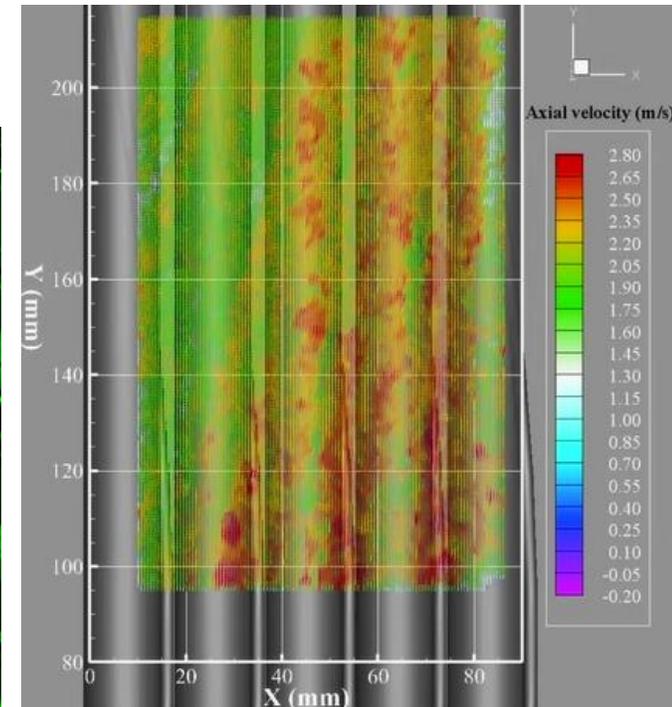
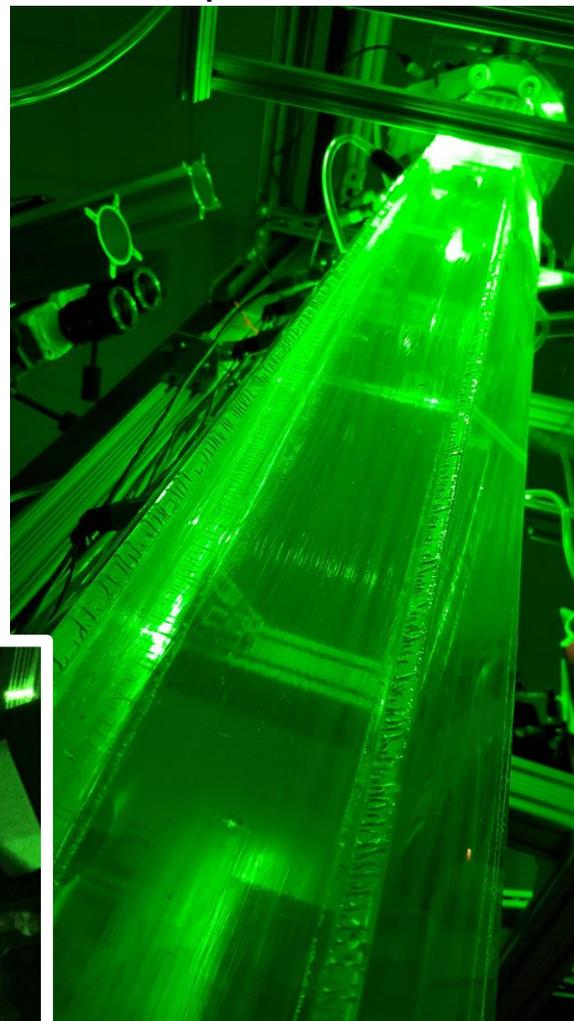
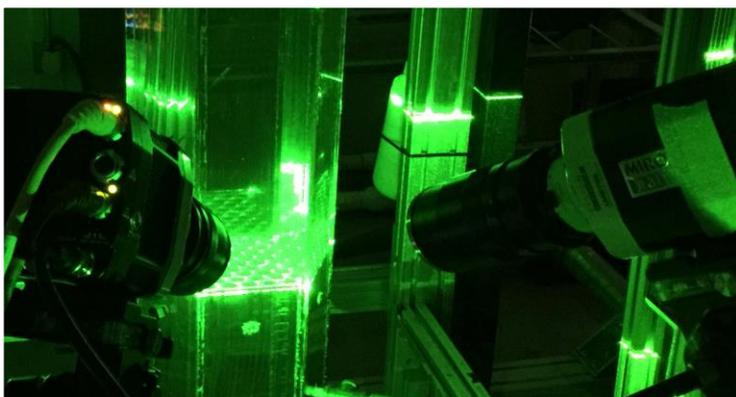
Wire Wrapped Bundle

Largest MIR Wire Wrapped Bundle in the Worlds

61 Wire-Wrapped Clear Acrylic Pins
 Fully Accessible Optical-Clear Test Section



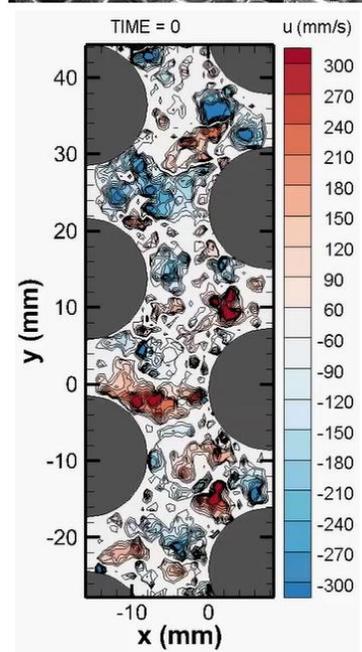
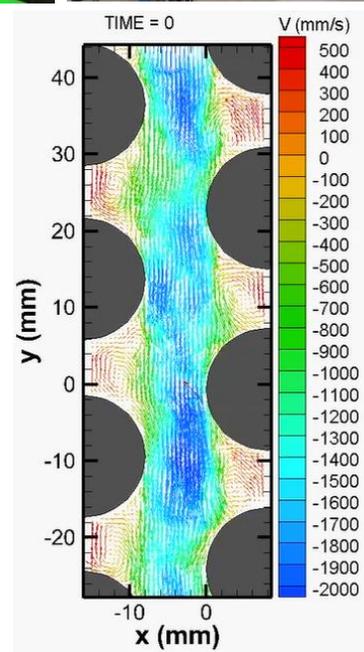
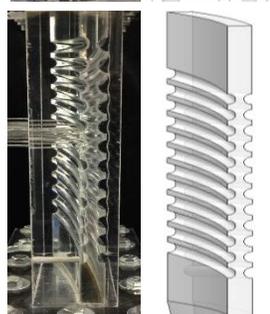
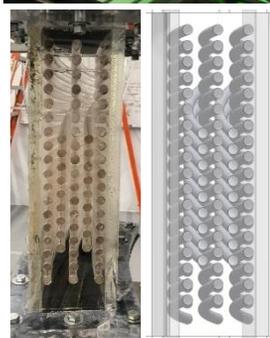
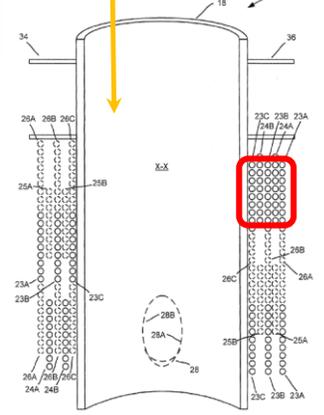
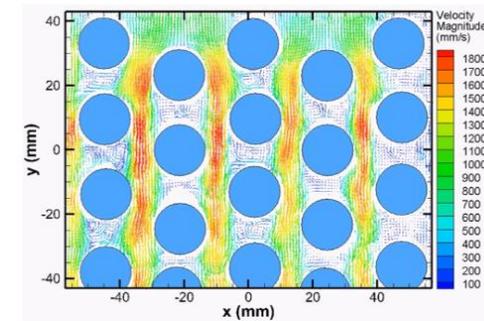
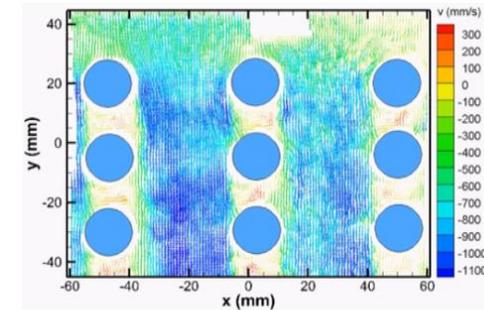
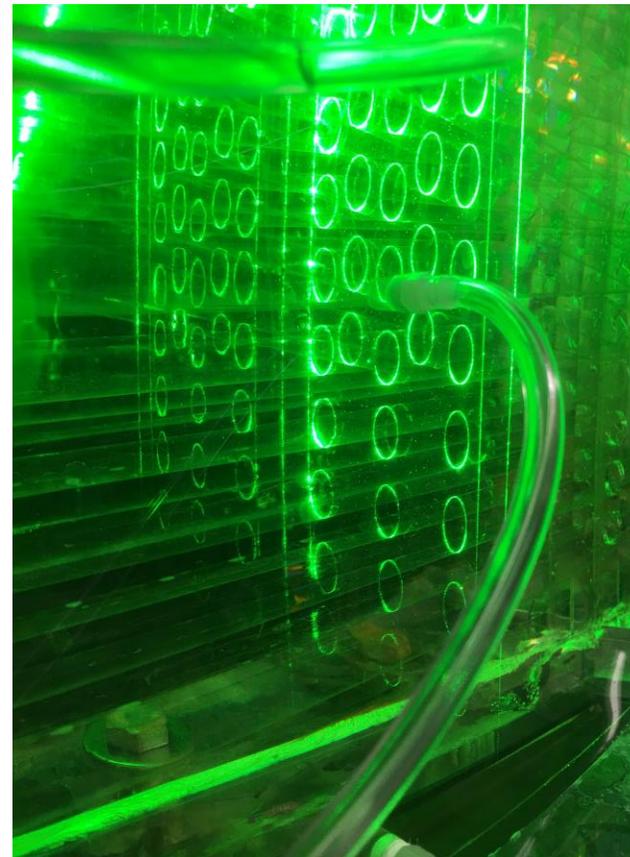
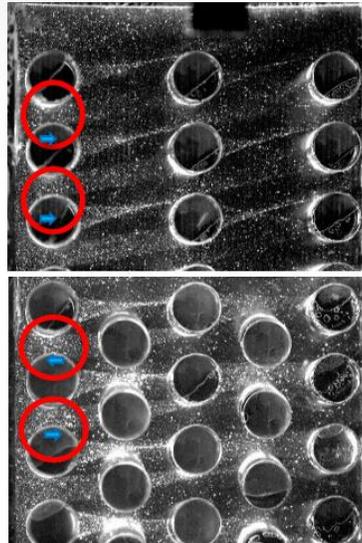
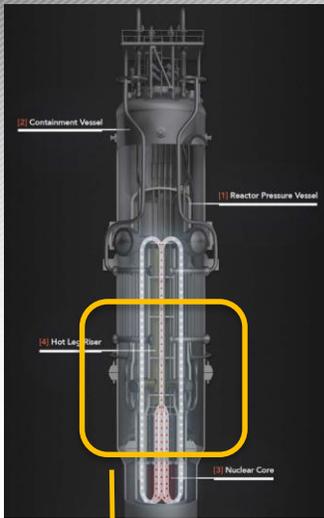
- State-of-the-art Laser-Based Techniques for High-Resolution Velocity Measurements
- Customizable Axial And Azimuthal Pressure Taps Locations
- Laminar, Transition, and Turbulent Regimes
- Different working Fluids





Advanced Nuclear Reactors Technology

Helical Coil Steam Generator

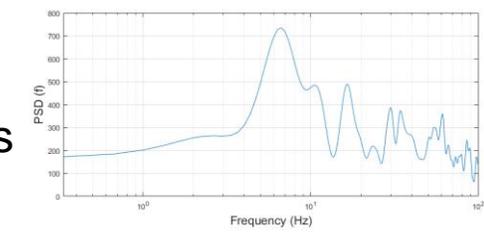
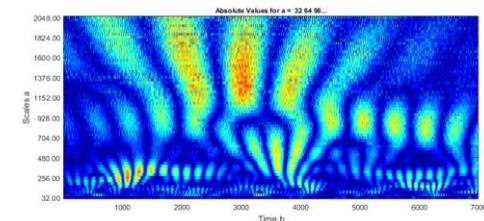


Customizable Test Sections

- Rod Diameter
- Pitch
- Lattice

Pressure Drop Measurements

High-Resolution Velocity Measurements

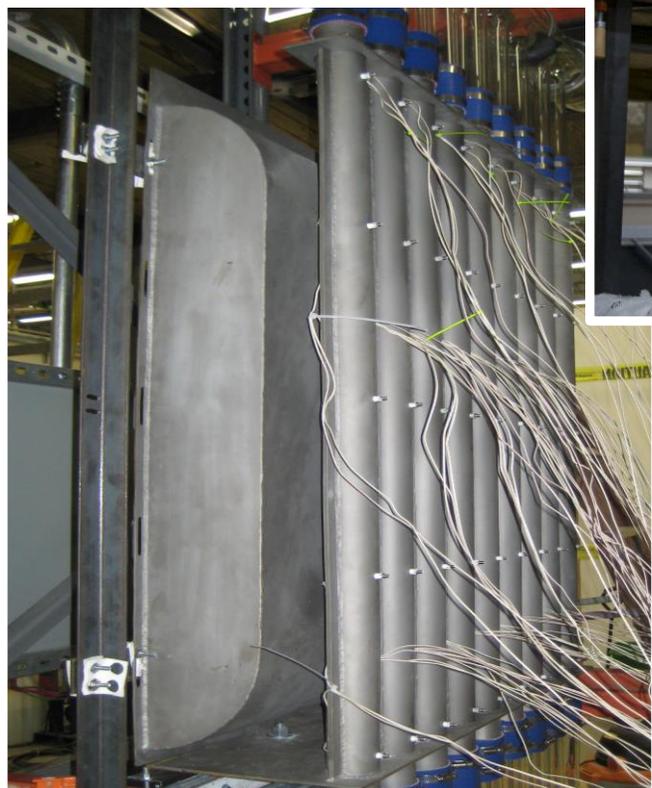


High Temperature Gas-Cooled Reactors

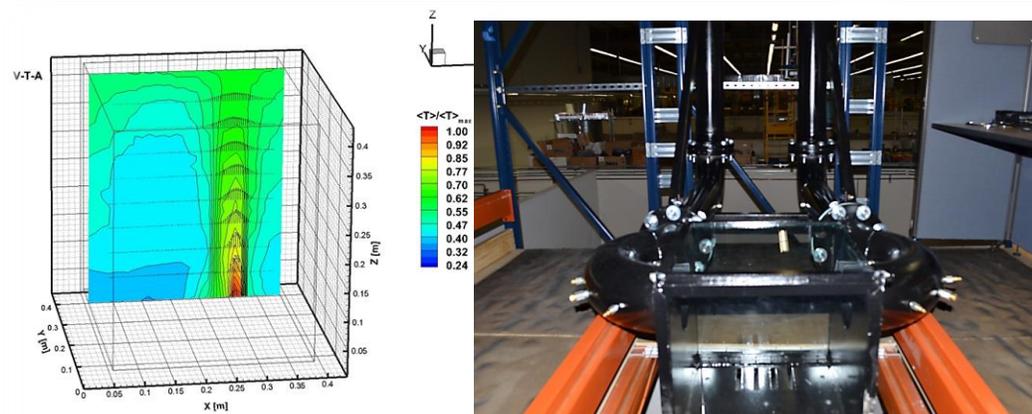
Water-Cooled RCCS

- ❑ Customizable Inlet Conditions
- ❑ Dual Chimney
- ❑ High-resolution Velocity and Temperature Measurements

Air-Cooled RCCS



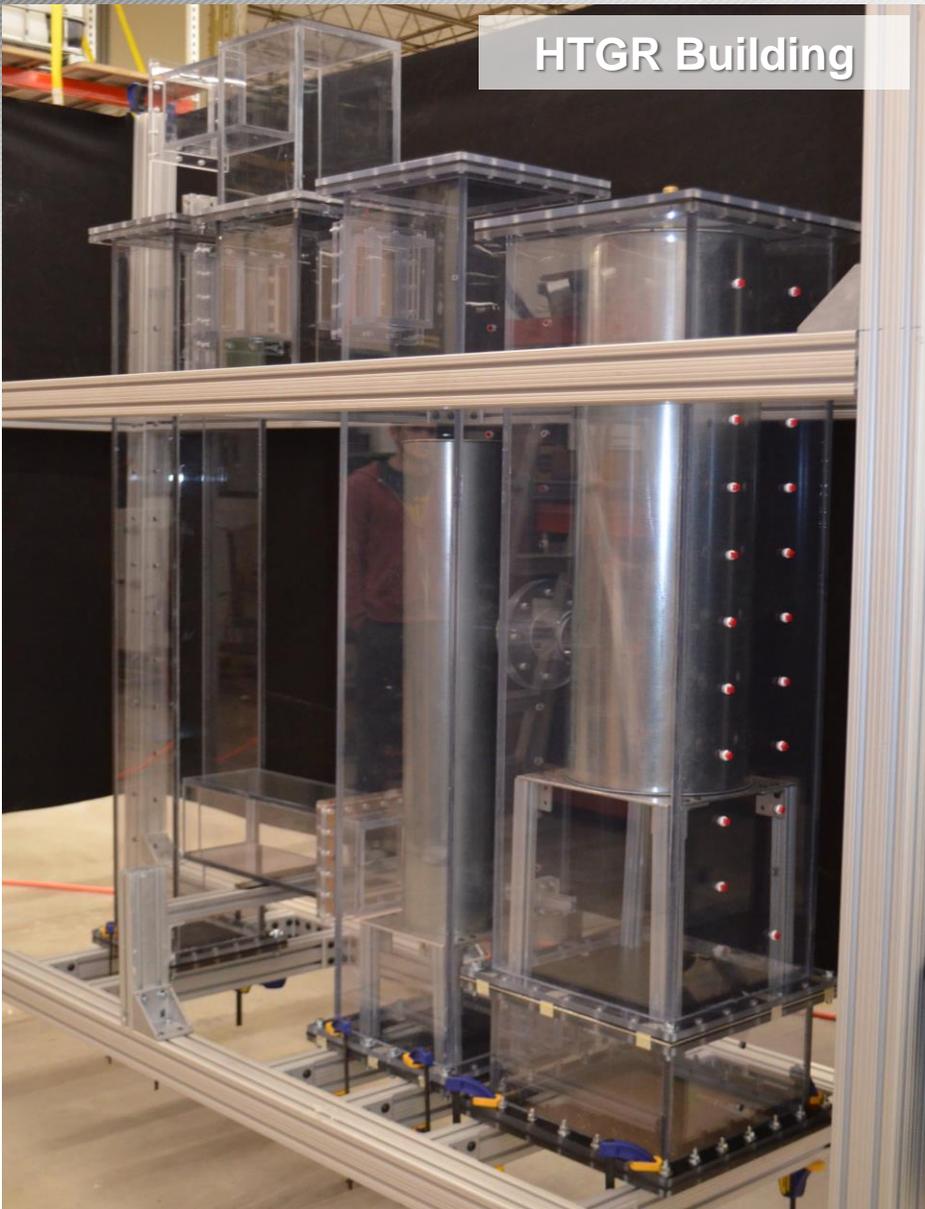
- ❑ 1/23 Length Scale
- ❑ Customizable Inlet/outlet Configuration
- ❑ Facility with the largest number of risers in the USA (9-Riser and 18-Riser Versions)





High Temperature Gas-Cooled Reactors

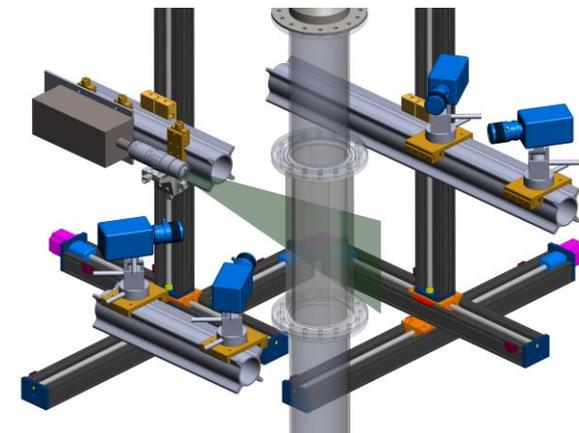
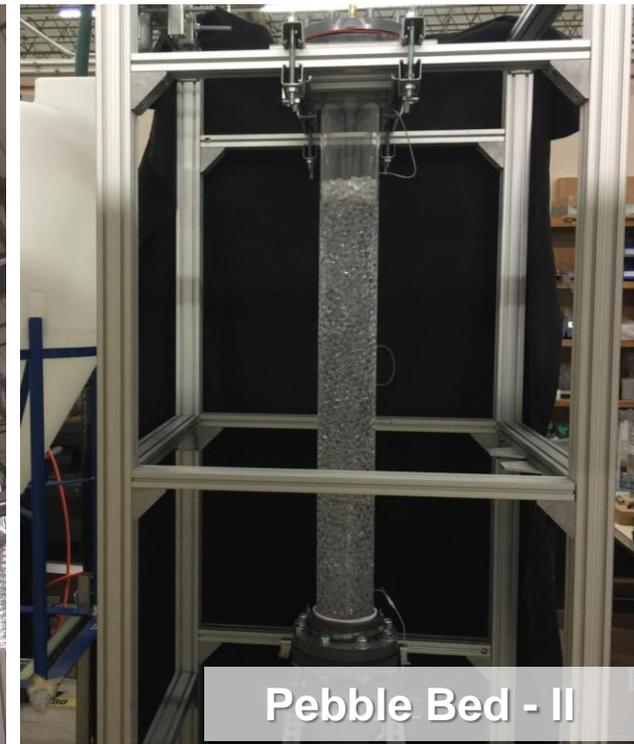
HTGR Building



Pebble Bed - I



Pebble Bed - II





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Laboratory Highlights

Infrastructure

14,000 ft²

Electrical Power: DC/AC, 1P/3P, 110V/240/480V

Cold Water Source, Compressed Air

2 Machine Shops

People

- 5 Full-time Professionals
- 6 PhD, 6 MS, 26 Undergraduate Students
- Nuclear, Mechanical, Chemical, Computer Science, Industrial Engineering

Quality Assurance Program

- Internal QAP → Training + Documentation
- Appendix B to part 50
- Graded approach to NQA-1

Parameter	Measurement Technique	Availability
Velocity	Particle Image Velocimetry (PIV) Systems (2D, Stereoscopic and Tomographic)	Now
	Laser Doppler Velocimetry (LDV) system	Now
Temperature	Distributed Temperature Sensors (DTS)	Now
	Laser Induced Fluorescence (LIF)	Now
Void Fraction	Optical Sensors	Now
	X-Ray Tomography, Optical Sensors	Fall 2017





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